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EXAMINER	
FAN, CHIEH M	
ART UNIT	**PAPER NUMBER**
2634	

DATE MAILED: 06/01/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/032,156	SHOKROLLAHI ET AL.	
	Examiner	Art Unit	
	Chieh M. Fan	2634	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 December 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-53* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8,15-17,26-30,32,33 and 50* is/are rejected.

7)☒ Claim(s) *9-14,18-25,31,34-49 and 51-53* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 May 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 1-53 are objected to because of the following informalities:

Regarding claim 1, "valid output symbols" in line 12 should be changed to --- valid output symbols, wherein N is an integer ---.

Regarding claim 6, "the number K" in line 2 should be changed to --- a number of K ---.

Regarding claim 9, "any N of the output symbols" in line 12 should be changed to --- any N of the output symbols, wherein N is an integer ---.

Regarding claim 11, "the number K" in line 2 should be changed to --- a number of K ---.

Regarding claim 18, "any N of the output symbols" in line 12 should be changed to --- any N of the output symbols, wherein N is an integer ---.

Regarding claim 19, "any N of the output symbols" in line 16 should be changed to --- any N of the output symbols, wherein t and N are integers ---.

Regarding claim 23, "any N of the output symbols" in line 12 should be changed to --- any N of the output symbols, wherein N is an integer ---.

Regarding claim 27, "valid output symbols" in line 16 should be changed to --- valid output symbols, wherein N is an integer ---.

Regarding claim 31, "any N of the output symbols" in lines 15-16 should be changed to --- any N of the output symbols, wherein N is an integer ---.

Regarding claim 34, "any N of the output symbols" in lines 15-16 should be changed to --- any N of the output symbols, wherein N is an integer ---.

Regarding claim 36, "any N of the output symbols" in line 11 should be changed to --- any N of the output symbols, wherein N is an integer ---.

Regarding claim 45, "receiving N output symbols" in line 12 should be changed to --- receiving N output symbols, wherein N is an integer ---.

Regarding claim 50, "valid output symbols" in lines 11-12 should be changed to --- valid output symbols, wherein N is an integer ---.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 27-30, 32 and 33 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 27 recites the limitation "the ordered set of input symbols" in line 14. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-3, 6, 7, 26, 27, 30, 32 and 50 are rejected under 35 U.S.C. 102(b) as being anticipated by Wolf (U.S. Patent No. 5,983,383).

Regarding claim 1, Wolf teaches a method of encoding data for transmission from a source to a destination over a communications channel, the method comprising:

arranging data to be transmitted into an ordered set of input symbols (2, 36 in Fig. 2);

generating a plurality of redundant symbols from an ordered set of input symbols to be transmitted (see 24 and 36 in Fig. 2); and

generating a plurality of output symbols from a combined set of symbols including the input symbols and the redundant symbols (28, 30 in Fig. 2), wherein the number of valid output symbols for a given set of input symbols is more than an order of magnitude larger than the number of input symbols (According to the applicants, the number of valid output symbols for a given set of inputs is only the inverse of a code rate. As shown in Fig. 2 of Wolf, the output symbols are obtained by encoding the input symbols using a RS encoder 24 followed by a convolutional encoder 28. The RS encoder may be a (5,14) encoder, see row 4 in Fig. 4. The convolutional encoder has a

code rate of 1/N, see col. 6, line 48. Therefore, the overall code rate is (5/14)x(1/N). When N is 4, the inverse of the overall code rate is 11.2, which is larger than 10.), wherein at least one output symbol is generated from more than one symbol in the combined set of symbols and from less than all of the symbols in the combined set of symbols (28 in Fig. 2 receives data from the 1st interleave 26, which interleaves more than one input symbol and one redundant symbols), such that the ordered set of input symbols can be regenerated to a desired degree of accuracy from N of the output symbols that are determined to be valid output symbols (108, 110, 112 in Fig. 5; as shown in Fig. 5, the viterbi decoder 108 receives the output symbols from the 1st de-interleaver 106, which in turn receives a plurality of output symbols in order to de-interleave).

Regarding claim 2, the plurality of output symbols of Wolf are transmitted over a communication channel (10, 12 in Fig. 1).

Regarding claim 3, Wolf teaches that the output symbols are stored in the interleaver 30 in Fig. 2 (an interleaver stores its input data in rows and reads out the data in columns, see col. 6, lines 40-42).

Regarding claims 6 and 7, as shown in Fig. 4 of Wolf, the number R of the redundant (i.e., parity) symbols varies according to the number K of input (i.e., information) symbols. The number K is variable, and is determined by a control processor (col. 6, lines 33-38 and 62-65).

Regarding claim 26, Wolf teaches that the step of generating the plurality of output symbols is performed using a convolutional encoder 28 (i.e., first device), and the

step of generating a plurality of redundant symbols is performed by a Reed-Solomon encoder 24 (i.e., second device) separated from the convolutional encoder.

Regarding claim 27, Wolf teaches a system of encoding data for transmission from a source to a destination over a communications channel, the system comprising:

A static encoder (24 in Fig. 2) coupled to receive a plurality of input symbols, the plurality of input symbols generated from data to be transmitted (2 in Fig. 2), the static encoder (24 in Fig. 2) including a redundant symbols generator that generates a plurality of redundant symbols based on the input symbols (24 in Fig. 2 is a Reed Solomon encoder, which generates a plurality of redundant symbols, i.e., parity, based on the input symbols); and

A dynamic encoder (28, 30 in Fig. 2) coupled to receive the plurality of input symbols and the plurality of redundant symbols, the dynamic encoder including an output symbol generator that generates a plurality of output symbols from a combined set of symbols including the input symbols and the redundant symbols, wherein the number of valid output symbols for a given set of input symbols is more than an order of magnitude larger than the number of input symbols (According to the applicants, the number of valid output symbols for a given set of inputs is only the inverse of a code rate. As shown in Fig. 2 of Wolf, the output symbols are obtained by encoding the input symbols using a RS encoder 24 followed by a convolutional encoder 28. The RS encoder may be a (5,14) encoder, see row 4 in Fig. 4. The convolutional encoder has a code rate of 1/N, see col. 6, line 48. Therefore, the overall code rate is (5/14)x(1/N). When N is 4, the inverse of the overall code rate is 11.2, which is larger than 10.)

wherein at least one output symbol is generated from more than one symbol in the combined set of symbols and from less than all of the symbols in the combined set of symbols (28 in Fig. 2 receives data from the 1st interleave 26, which interleaves more than one input symbol and one redundant symbols), such that the ordered set of input symbols can be regenerated to a desired degree of accuracy from N of the output symbols that are determined to be valid output symbols (108, 110, 112 in Fig. 5; as shown in Fig. 5, the viterbi decoder 108 receives the output symbols from the 1st de-interleaver 106, which in turn receives a plurality of output symbols in order to de-interleave).

Regarding claim 30, Wolf also teaches a transmit module (32 in Fig. 2) coupled to the dynamic encoder (28, 30 in Fig. 2).

Regarding claim 32, Wolf also teaches a key generator ("code rate select" in Fig. 3) for the static encoder 924 in Fig. 2).

Regarding claim 50, Wolf teaches a computer data signal embodied in a carrier wave comprising:

A plurality of output symbols (output of 28 in Fig. 2), wherein the plurality of output symbols represents symbols generated from a combined set of symbols including an ordered set of input symbols (2 in Fig. 2) and redundant symbols (24 in Fig. 2), wherein the redundant symbols are generated from the input symbols (24 in Fig. 2 is a Reed Solomon encoder, which generates a plurality of redundant symbols, i.e., parity, based on the input symbols), wherein the number of valid output symbols for a given set of input symbols is more than an order of magnitude larger than the number of input

symbols (According to the applicants, the number of valid output symbols for a given set of inputs is only the inverse of a code rate. As shown in Fig. 2 of Wolf, the output symbols are obtained by encoding the input symbols using a RS encoder 24 followed by a convolutional encoder 28. The RS encoder may be a (5,14) encoder, see row 4 in Fig. 4. The convolutional encoder has a code rate of 1/N, see col. 6, line 48. Therefore, the overall code rate is (5/14)x(1/N). When N is 4, the inverse of the overall code rate is 11.2, which is larger than 10.), wherein at least one output symbol is generated from more than one symbol in the combined set and from less than all of the symbols in the combined set of symbols (28 in Fig. 2 receives data from the 1st interleave 26, which interleaves more than one input symbol and one redundant symbols); such that a receiver of the data signal can regenerate the ordered set of input symbols to a desired degree of accuracy from N of the output symbols (108, 110, 112 in Fig. 5; as shown in Fig. 5, the viterbi decoder 108 receives the output symbols from the 1st de-interleaver 106, which in turn receives a plurality of output symbols in order to de-interleave).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 4, 5, 15-17, 28 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wolf (U.S. Patent No. 5,983,383).

Regarding claims 4, 5, 28 and 29, Wolf teaches the claimed invention (see the rationale applied to claims 1 and 27 above), but does not specify whether the N is greater or less than the number of input symbols in the ordered set of input symbols. However, since both situations are claimed in claims, the claimed limitations appear to be only design options, dictated by the system requirement and the user's need. The number of the input symbols depends on the amount of information to be transmitted and the number N depends on the degree of interleaving in the interleaver of West. Both numbers clearly may be selected according to the system's requirement and the user's need and do not impact the operation of Wolf.

Regarding 15-17, claims 15-17 are directed to "the desired accuracy", which is only a matter of design choice depending on the user's need. The desired accuracy only changes the process of recovering the data according to the user's need at the receiving end. It will not change the operation of West's method of encoding data for transmission, which is performed at the transmitting end. It would have been obvious to a user to select any desired accuracy to meet the user's need.

8. Claims 8 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wolf (US Patent 5,983,383) in view of Dillon et al. (US Patent 6,430,233).

Wolf teaches the claimed invention, see the rationale applied to claims 1 and 27 above, but fails to teach that the plurality of redundant symbols is generated according

to a LDPC code (Wolf teaches the plurality of redundant symbols is generated according to a Reed-Solomon code). However, both LDPC code and Reed-Solomon are well known and widely used in the art for forward error correction. Dillon et al. teaches using a LDPC code or Reed-Solomon code as an error correction code (claim 47). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to generate the plurality of redundant symbols is generated according to a LDPC code so as to improve the reliability of communication.

Allowable Subject Matter

9. Claims 9-14, 18-25, 31, 34-49 and 51-53 would be allowable if rewritten to overcome the claim objections above.

Response to Arguments

10. Applicant's arguments filed 12/21/04 have been fully considered but they are not persuasive.

Beginning on page 15 through page 17 of the reply, the applicants continue to argue that the number of valid output symbols for a given set of inputs is only the inverse of a code rate and assert that Wolf does not teach "generating a plurality of output symbols from a combined set of symbols ... where the number of valid output

symbols fro a given set of input symbols is more than an order of magnitude larger than the number of input symbols".

Examiner's response --- In response to the argument, the examiner notes that the specification of the instant application never defines the number of valid output symbols as the applicants argued. In fact, the term "valid output symbols" has never appeared in the specification. Nevertheless, for the sake of argument, the examiner notes that, as shown in Fig. 2 of Wolf, the output symbols are obtained by encoding the input symbols using a RS encoder 24 followed by a convolutional encoder 28. The RS encoder may be a (5,14) encoder, see row 4 in Fig. 4. The convolutional encoder has a code rate of 1/N, see col. 6, line 48. Therefore, the overall code rate is (5/14)x(1/N). Although the value of N is not specified, N may implicitly/inherently take any reasonable and practical values as required. The examiner hereby present a side reference Noreen et al. (U.S. Patent No. 5,455,823), which teaches a convolutional code with a code rate of ¼ (col. 17, line 36). Therefore, it is clear a convolutional code with a code rate of ¼ is reasonable and practical. When N is 4, the inverse of the overall code rate is 11.2, which is larger than 10. Therefore, the limitation, "the number of valid output symbols fro a given set of input symbols is more than an order of magnitude larger than the number of input symbols" is clearly achievable in Wolf.

Conclusion

11. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chieh M. Fan whose telephone number is (571) 272-3042. The examiner can normally be reached on Monday-Friday 8:00AM-5:30PM, Alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin can be reached on (571) 272-3056. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chieh M Fan
Primary Examiner
Art Unit 2634

May 24, 2005